

Title: Functional domains of HC-Pro of ZYMV involved in suppressor activity and symptom expression

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Abstract:

Zucchini yellow mosaic virus (ZYMV) causes major foliar deformation with blisters and mosaics in cucurbits, eventually developing a filamentous leaf phenotype. The potyvirus Helper-Component (HC-Pro) is a multifunctional protein, one function of which is as a suppressor of gene-silencing that would otherwise target viral RNA. Point mutation in the conserved FRNK motif of HC-Pro to FINK, FRNL and FRNA dramatically reduces symptoms without reducing virus viability, and did not affect suppressor activity. In addition, HC-Pro with charged motifs FRNK and FKNK bound duplex-siRNA stronger than the lesser charged mutants FINK, FRNA and FRNL. Thus, we found a correlation between binding affinity to siRNA-duplex and symptoms of the virus carrying such a mutation. ZYMV infection causes accumulation of selected microRNAs, and strikingly, of microRNA*. ZYMV^{FRNK} infection caused a greater rise in uncleaved transcript accumulation of a small number of genes than did infection with ZYMV^{FINK}. The mRNA levels of INCURVATA-4 and PHAVOLUTA, both miR166-targeted HD-ZIP family transcription factors, rise upon infection with the severe ZYMV^{FRNK} in the first true leaf 5 dpi. This, together with the importance of HD-ZIP proteins in plant developmental control, fits the theory that an uncontrolled increase in these proteins could contribute to the symptoms seen later on in virus infections. Thus, the underlying mechanism for such symptom expression is hypothesized to be the deregulation of the response to microRNAs by HC-Pro, causing up-regulation of target mRNAs.